

Claims

[c1] What is claimed is:

1. A heat sink fan for cooling a heat generating electrical component, comprising:

a heat sink including a base portion with a central axis and a plurality of heat radiating fins integrally or fixedly formed on the side surface of the base portion, each of the heat radiating fins extending away from the central axis, and having at least one end rim face;

a fan motor unit including an axial flow fan having a rotational axis, a housing unit connected fixedly with the axial flow fan, the housing unit having a housing and at least one arm portion, wherein the fan motor unit is arranged by the housing unit where the rotational axis is substantially corresponding to the central axis on a first end of the heat sink, for supplying cooling air to the heat sink, the arm portion is extending from the housing to a second end side of the heat sink, and an engaging portion is formed at a tip of the arm portion; and

a protrusion or a recess formed on an envelope surface of the end rim faces of the heat radiating fins, wherein the engaging portion is engaged with the protrusion or the recess so that the fan motor unit is attached to the

heat sink with restriction of relative movement in the axial direction.

- [c2] 2. The heat sink fan according to claim 1, wherein the protrusion or the recess is formed by a machining process of the envelope surface after forming the base portion and the heat radiating fins.
- [c3] 3. The heat sink fan according to claim 1, the fan motor unit additionally having at least one positioning portion extending from the housing to the second end side of the heat sink, wherein an inner surface of the positioning portion is contacted with a part of an envelope surface of the heat radiating fins, for preventing the fan motor unit from moving against the heat sink radially.
- [c4] 4. The heat sink fan according to claim 1, wherein at least one flat envelope portion is formed on the envelope surface of the heat radiating fins, the flat envelope portion being parallel to the central axis and formed by controlling lengths of a portion of the heat radiating fins in directions away from the central axis.
- [c5] 5. The heat sink fan according to claim 1, wherein the heat radiating fins extend radially with being curved in a predetermined direction with respect to the central axis.
- [c6] 6. The heat sink fan according to claim 1, wherein the

heat radiating fins extend radially with being slanted in a predetermined direction with respect to the central axis.

- [c7] 7. The heat sink fan according to claim 1, wherein the engaging portion is formed like a pawl or a hook extending from the tip of the arm portion toward the central axis.
- [c8] 8. The heat sink fan according to claim 1, wherein two or more the arm portions is extending from the housing to a second end side of the heat sink.
- [c9] 9. The heat sink fan according to claim 8, wherein two or more the positioning portion is extending from the housing to the second end side of the heat sink.
- [c10] 10. A heat sink fan for cooling a heat generating electrical component, comprising:
a heat sink including a base portion with a central axis and a plurality of heat radiating fins integrally or fixedly formed on the side surface of the base portion, each of the heat radiating fins extending away from the central axis, and having at least one end rim face;
a fan motor unit including an axial flow fan having a rotational axis, a housing unit connected fixedly with the axial flow fan, the housing unit having a housing and two or more arm portions, wherein the fan motor unit is

arranged by the housing unit where the rotational axis is substantially corresponding to the central axis on a first end of the heat sink, for supplying cooling air to the heat sink, the arm portions is extending from the housing to a second end side of the heat sink, and two or more engaging portions is formed at a tip of the arm portions; and

two or more protrusions or recesses formed on an envelope surface of the end rim faces of the heat radiating fins, wherein the engaging portions is engaged with the protrusions or the recesses so that the fan motor unit is attached to the heat sink with restriction of relative movement in the axial direction.

[c11] 11. The heat sink fan according to claim 10, wherein the fan motor unit additionally having at least one positioning portion extending from the housing to the second end side of the heat sink, wherein a inner surface of the positioning portion is contacted with a part of an envelope surface of the heat radiating fins, for preventing the fan motor unit from moving against the heat sink radially.

[c12] 12. The heat sink fan according to claim 10, wherein the fan motor unit additionally having two or more positioning portions extending from the housing to the second end side of the heat sink, wherein a inner surface of the

positioning portions are contacted with a part of an envelope surface of the heat radiating fins, for preventing the fan motor unit from moving against the heat sink radially.

[c13] 13. A method for manufacturing a heat sink that is placed on a heat generating electrical component, the method comprising the steps of:
forming a heat sink that includes a base portion with a central axis and a plurality of heat radiating fins integrally or fixedly formed on the side surface of the base portion, each of the heat radiating fins extending from the central axis, and having at least one end rim face;
and
forming a protrusion or a recess on an envelope surface of the end rim faces of the heat sink by a machining process.

[c14] 14. A method for manufacturing a heat sink that is placed on a heat generating electrical component, the method comprising the steps of:
forming a base member having a central axis;
forming a heat sink including a plurality of plate-like heat radiating fins integrally or fixedly formed on the side surface of the base portion, each of the heat radiating fins extending from the central axis, and having at least one end rim face, and a central hole arranged in the

center of the heat radiating fins;
forming a protrusion or a recess on an envelope surface
of the end rim faces of the heat sink by a machining process; and
pressing the base member to fit in the central hole of the
heat sink and to be fixed to the heat sink.